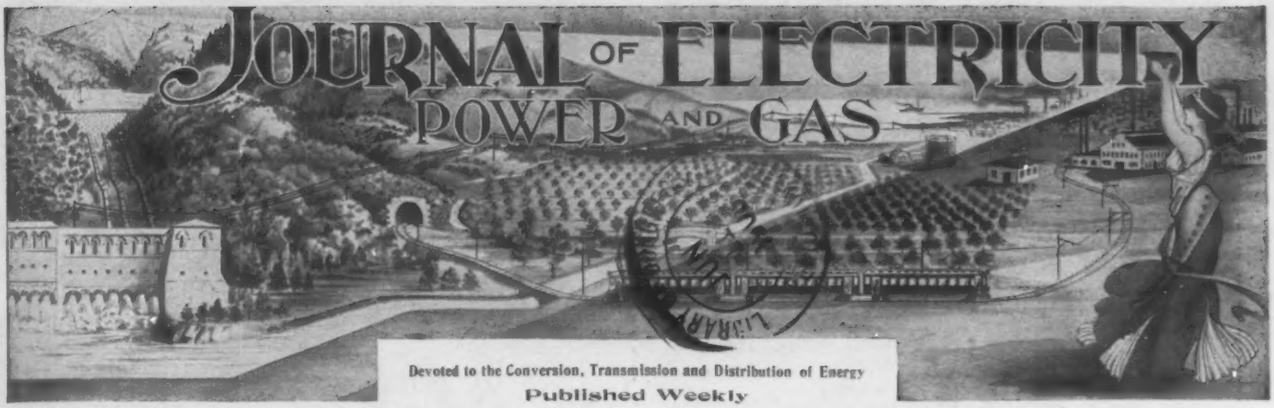
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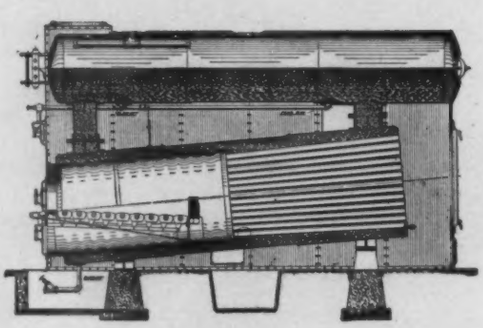

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VOLUME XX. SAN FRANCISCO, CAL., JUNE 6, 1908 No. 23

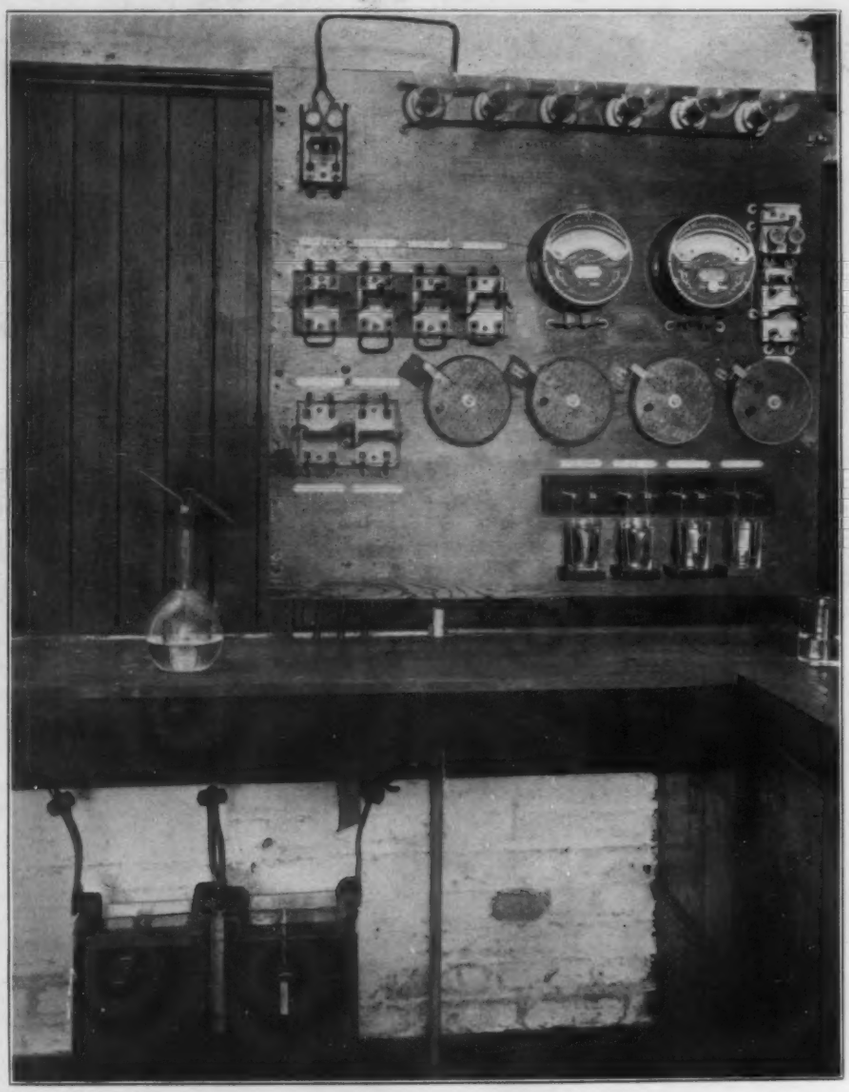
AN ELECTROLYTIC SWITCHBOARD

By LOUIS J. BORIE

The switchboard herein described was designed and installed by the writer at the request of the Bretherton Metallurgical Co., in their laboratory at 532 Commercial St., San Francisco.

The switchboard is used in electrolytic determinations of copper and other metals on control and umpire work, and in its construction it was sought to combine low initial cost with maximum convenience of manipulation.

The board proper, measuring 3 feet by 3 feet 6 inches, is made of well seasoned 1-inch redwood planks, glued together and prevented from warping by end strips affixed in the usual manner. Two coats of paraffine paint preclude absorption of moisture. The board stands out from the wall about two and one-half inches, and is hinged to allow for inspection of connections.



ELECTROLYTIC SWITCHBOARD.

Referring to accompanying cut, it will be noted that four determinations may be conducted simultaneously. The current used is taken from two 80-ampere-hour "chloride" cells charged from direct current mains through six 32-candle-power lamps. The storage battery current is distributed to the various circuits by porcelain double pole, double throw switches, which also permit the introduction of either or both the measuring instruments into any or all of the four circuits.

The volt and ampere meters, scaled respectively from 1 to 15 and 1 to 10, are of the Weston soft iron, dead heat type, graduated in divisions of one-fifth, but easily readable to one-twentieth.

Each circuit is provided with a simple though efficient rheostat, controlling the current by steps of .01 of one ampere. An oak disc has been subtituted for the usual metallic rheostat arm. On the circumference is a groove in which is laid a spirally wound wire of proper resistance. One end of the wire is lead to the central bearing of the disc, thus forming one terminal. The other end is open, contact being made by means of a spring connection infringing on the circumference as the disc is rotated to vary the resistance

A special effort was made to devise a handy form of electrode holder, particularly as regards that of the cathode. Rotating anodes, for special reasons, were not wanted in this case, otherwise they might with advantage have been furnished. Although operated under low voltage, the switchboard is as thoroughly protected electrically as though subject at all times to service potentials.

DISTILLATION OF TURPENTINE BY ELECTRICITY.*

By F. T. Snyder.

Pine woods contain a series of volatile hydro-carbons having boiling points varying from 130° C. to 250° C. A mixture of these, including the groups which boil between 155° C. and 170° C., forms what is commercially known as turpentine. The principal constituent of this turpentine is pinene, with a boiling point of 155° to 156° C.

The process of obtaining turpentine from wood by distillation is an extractive one, in that the turpentine exists in the wood substantially in the form in which it is obtained, and is not a product of decomposition at the time of extraction. At 175° C., the pinene of the turpentine begins to break up into a mixture of lighter and heavier hydro-carbons, the decomposition being substantially complete at 270° C. It is, therefore, necessary to distill turpentine within relatively narrow temperature limits. If the wood from which the turpentine is distilled is not heated enough, part of the turpentine will be left in the wood. If it is heated too hot, part of the turpentine produced will be destroyed. Many of the products formed in breaking up turpentine have strong odors, and a small percentage materially affects the selling price of the turpentine produced, as the smell nauseates the painter using the turpentine. It requires a certain drop of temperature to cause the heat needed to flow from the exterior to the center of a turpentine retort, and this further reduces the narrow range of temperature available.

It has been known for many years that the fir wood of the North Pacific Coast contains a considerable quantity of turpentine, and efforts had been made to utilize it as a basis for the commercial production of turpentine. The principal difficulties encountered were those inherent in the close regulation of temperature necessary. Some years ago the obvious possibility of close temperature regulation obtainable with heat from electricity suggested the use of heat from electricity in the distillation of turpentine from this fir wood. At Vancouver, British Columbia, a considerable supply of waste fir wood was available, in the form of saw-mill refuse, and electricity from waterpower was available at a low cost. An experimental electric turpentine plant, with a capacity of one-sixteenth of a cord, was erected and tested, and subsequently reported upon by Dr. T. H. Bray, of the Massachusetts Institute of Technology. As a result of Dr. Bray's report, a commercial plant, with a capacity of three cords per day, was erected, and has been in operation at Vancouver since July, 1907.

The wood supply for this plant is brought in by barge, from neighboring saw-mills, and landed at a dock adjoining the plant. On this dock the wood is filled into cans, which are wheeled into the plant, picked up by an overhead crane (Fig. 1), and dropped into a brick retort, forming one of a group which are placed together to reduce radiation. The top of the can forms a flange, which dips into a groove around the top of the retort, filled with tar, forming a gas seal when the can is in the retort. Electricity at 110 volts is carried through wrought-iron strips threaded through the brickwork on each side of each retort. The current supply for each retort is controlled by a switchboard of ordinary type, which also holds the direct-reading pyrometers, one of which registers the temperature at the outside of the can, and one the temperature at the center of the can, showing the maximum and minimum temperature conditions in the can. The leads of these pyrometers end in flexible extensions on the top of the retorts, which can be changed from can to can (Fig. 2).

FIG. 1. DISTILLATION OF TURPENTINE BY ELECTRICITY.—RECEPTACLE CONTAINING WOOD BEING PLACED INTO RETORT.

The turpentine vapor is taken from the retort through a removable copper outlet pipe. This outlet pipe leads to a condenser (Fig. 3), which consists of an upright copper pipe, down which a spray of water is passed through the ascending turpentine vapor, and which terminates in a tank at the bottom. The tank serves as a separator for the condensed turpentine and water, the turpentine readily floating to the top of the water. The excess

*Paper read at Albany meeting of American Electrochemical Society. For the illustrations we are indebted to the courtesy of the Western Electrician of Chicago.

water from the spray is withdrawn from the bottom of the tank, and the turpentine taken off from the top of the tank into a storage system.

The brickwork of the retort, when a can newly filled with wood is put in it, is about 250° C. The cold can rapidly absorbs heat from this brickwork, the temperature of the brickwork being

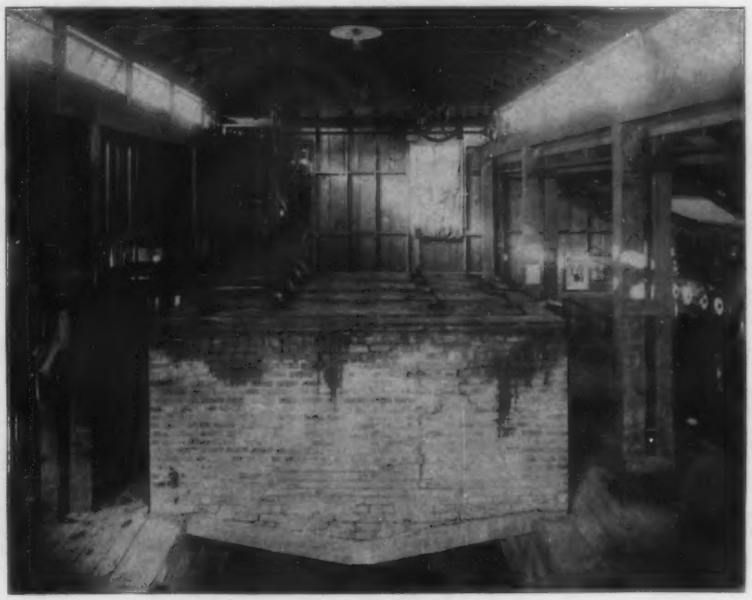


FIG. 2. VIEW SHOWING CANS IN RETORT. TURPENTINE VAPOR PASSES OFF THROUGH OUTLET PIPES SHOWN.

kept up by a current of 400 amperes, which is put through the resistance strips for about two hours. During this time the temperature at the outside of the can rises from 75° to 130° C., at which turpentine begins to come off, and at which time the center of the can is at 45° C. The current is then shut off, and the temperature of the can slowly rises by absorption of heat from the brickwork for two hours longer, when the temperature has reached 150° C. on the outside of the can and 205° C. in the center of the can, and the turpentine has been substantially all removed. In practice, it is found that from 90 to 95 per cent of the turpentine in the wood, as determined by analysis, is removed during this interval. While the turpentine is coming off, the pitch in the wood melts and runs down to the bottom of the can and out through perforations, and is collected in the bottom of the retort, from which it is drawn off, at the end of the run, into the barrels in which it is shipped.

It will be noted that the temperature of the interior of the can at the end of the turpentine run is hotter than the outside. This is due to the heat which is beginning to be liberated by the decomposition of the hydro-carbons in the wood. At this point the can is lifted by the overhead crane from the turpentine retort and put into the adjoining retort, a new can of raw wood taking its place in the turpentine retort. In its new position the original can of wood, from which the turpentine has been extracted, is connected up by another copper outlet pipe to the adjacent condenser. This change of retort and piping keeps the turpentine condenser and piping from being fouled by tar oil or tar products.

Due to the continued decomposition of the wood, the temperature steadily rises without further use of electricity, and the resulting decomposition gives a product known commercially as "tar oil" and which comes off as vapor and is condensed. The other product of this decomposition is wood tar, which trickles down as the rosin did in the turpentine retort, and is collected in the bottom of the tar retort. It is found in practice that this tar tends to break up at the final temperature of the tar retort, and it is consequently drawn off continuously, during the tar run, into the barrels into which it is to be shipped.

At the end of three hours of the tar run, the temperature in the center of the can has risen to 375 degrees Centigrade, and tar oil and tar stop coming off. The can is then lifted out and stood on a sand floor, which makes an air seal with the lower edges of the can and protects from combustion the contents of the can, which now consists of charcoal. When the can and its charcoal contents are cool, which takes about three hours, the perforated bottom of the can is tripped and the can lifted, allowing the charcoal to fall out. This charcoal is then put in sacks as required by the trade which consumes it.

Five products are produced from the wood—turpentine and rosin in the turpentine retort, tar oil and tar in the tar retort, and a residual product of charcoal. The amount and kinds of product derived from any supply of wood depend on the character of the wood. The following will indicate the results which are being secured from the British Columbia coast fir per 1,000 pounds of wood:

Turpentine	6.7	gallons
Rosin	168	pounds
Tar Oil	5.1	gallons
Tar	68	pounds
Charcoal	323	pounds

It may be noted that this charcoal being retort charcoal and cooled out of contact with air, is tough and suitable for special purposes. The amount of wood held by a can varies with the quality of the wood, but averages at Vancouver about 1,000 pounds. The electricity used per can is about 90 kilowatt-hours, and costs, at Vancouver, 18 cents per can of wood.

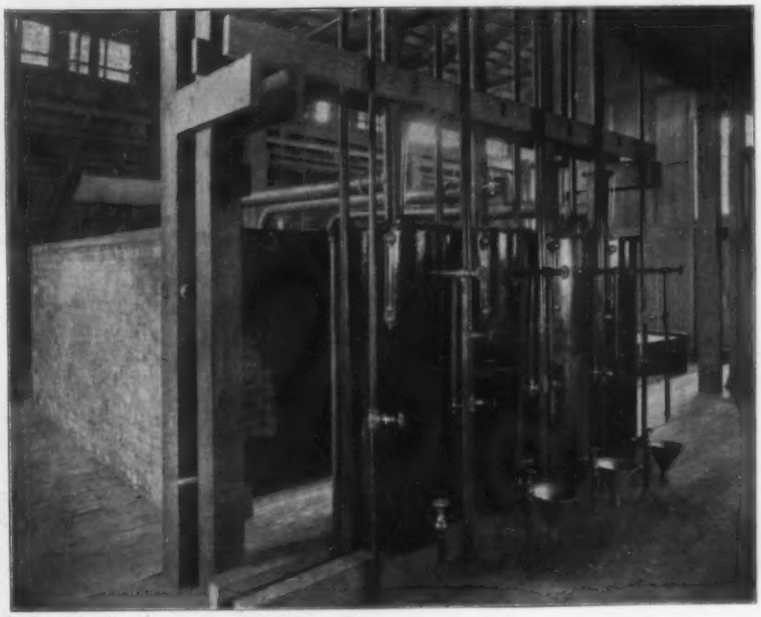


FIG. 3. VIEW SHOWING TURPENTINE CONDENSERS WHICH RECEIVE THE VAPOR FROM RECEPTACLES IN RETORT.

The plant is operated by one man on each shift, there being two 12-hour shifts per day. When the wood is large, an extra man is employed on the day shift to split it.

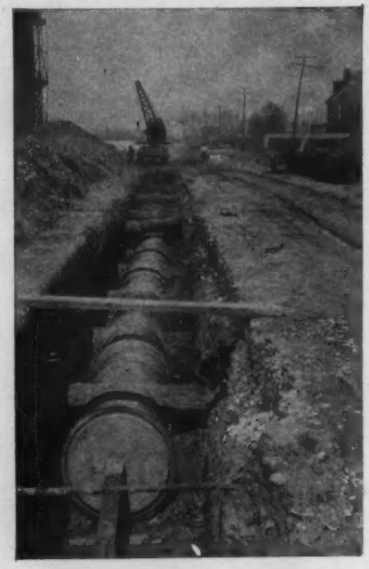
EVOLUTION OF CAST IRON PIPE.*

(Concluded.)

Cement Joints Made in Winter.—In the eastern part of the country where more or less cold and freezing weather is experienced in the winter time good results in laying pipe with cement joints in winter are difficult to obtain. They can be secured, however, and the experience of one of our friends in putting down a main 8½ miles in length, partly of 16-inch and partly of 20-inch cast iron bell and spigot pipe, is of interest. This line runs in part through open country. He writes: "A large part of the work was done during the winter of 1903-1904, which was an unusually severe one, the thermometer a number of times during January and February going below zero. The thermometer averaged below freezing from the middle of December until some time in March, so that there was scarcely any weather which would have been considered suitable for making cement joints. In laying this line, the joints were tested under three pounds pressure between thirty-six and forty-eight hours after they were made. Between October 30th and December 14th, of the 1,289 joints that were made, 30 were found leaking and were re-made. Between December 15th and March 8th, 2,352 joints were made, and out of these, 225 were found leaking. There were 3,641 joints on the line, and the total number re-made was 255. We have been over the line this year and have found it in almost perfect condition." As this was the first pipe put down with cement joints at this plant, it was necessary at the same time to train the men. Hence the loss in joints between October 30th and December 14th mainly resulted from the fact that the men were learning. The loss between December 15th and March 8th was largely due to freezing. Had the line been laid in seasonable weather, comparatively few leaks would have developed. The freezing of the joints occurred in spite of every effort to keep them covered and warm until set, but as the pipe were tested in the open trench, the leaks were easily located and re-made, and the line is now most satisfactory. The climatic conditions along the Pacific Coast are almost ideal for the making of cement joints and if an ordinary lead joint were made every four to six lengths, possibly there would be sufficient elasticity in a line of pipe to take care of the vibration due to an earthquake of ordinary severity. The City of Santa Ana in Southern California is using cement for joints with good success.

High vs. Low Pressure Gas Mains.—Within recent years, some engineers have sought economy in using comparatively small diameter wrought iron or steel mains under relatively high pressure, for carrying gas from works to a center of distribution at some distance. These mains will not prove as durable as cast iron pipe, and it is a serious question whether a larger diameter cast iron main under low pressure will not in the long run prove the less costly. While the low-pressure main may involve a greater first cost, the high-pressure line usually carries a heavy daily charge for pumping and maintenance, added to which is often a material loss in candle power. These are factors which it is our impression have not been as carefully estimated as their importance warranted.

Gas Mains with Turned and Bored Joints.—The foregoing may be said to outline general practice for lead and cement joint cast iron gas mains in the United States. Abroad, however, the practice varies, and many prominent users prefer the turned and bored joint. One prominent gas engineer in London writes: "We continue the use of gas pipe with turned and bored joints." Another: "We do not use turned and bored joints; we prefer the ordinary spigot and socket joint made with lead rings run into the socket, as being a more flexible connection, and one which can be more easily made sound by setting up, should any subsidence occur, which has tended in any way to loosen the joint." Evidently "doctors disagree." It is nevertheless true that the turned and bored joint has been adopted with satisfaction in many important gas plants in England and other countries, while we may say it is not used at all in the United States. Our inquiries as to gas leakage in cast iron pipe having turned and bored joints have failed to bring definite response in figures or percentages, the usual statement being that the joint leakage is very small. For those who prefer an iron-to-iron joint, the turned and bored pipe are offered as being of the most commonly used and simplest type, avoiding use of bolts. These pipe are also cast vertically in dry sand and finished in lengths to lay 12 feet, our standard specifications being followed as far as they apply to pipe of this design. All bells and spigots are machined to template, insuring close-fitting iron-to-iron joints easily laid. The turned and bored joints for gas mains should only be used in districts where streets are straight and the soil is very good and firm, as any subsidence or movement may lead to fracture and consequent large and perhaps dangerous leakage. There may be reasons for adopting the turned and bored joint of which we are not advised, but considering the excellent results obtained with the bell and spigot joint in the United States and apparently abroad, we agree with still another London engineer who writes: "I do not consider that the turned and bored joint offers any advantage over the lead joint generally used for gas mains, unless it be in the speed and facility with which they may be laid." With turned and bored pipe, special castings with bells all around are usually supplied, and into these bells a cut pipe is perhaps as often inserted as is the turned spigot.



LOW PRESSURE GAS MAIN.

Cast Iron vs. Riveted Steel Pipe.—The question of the life of cast iron as compared with wrought iron or steel-riveted pipe is best answered by comparison. In 1905, at Portland, Oregon, the contract for cast iron pipe was awarded at a very marked increase in the total cost, as compared with tenders for steel. Owing to the distance from the foundries the cost of freighting became a most important factor, because of the great difference in weight, which naturally favored the lighter or steel pipe. This award of the contract for cast iron pipe, was not made until after a very careful investigation on the part of the engineer, D. D. Clarke, Esq., who, during the fall of 1905, visited some fifteen cities to confer with the officials in charge of water supply, as to their experience with riveted steel mains and to ascertain for himself what he could as to their condition.

*Contributed by R. W. Martindale.

During 1893 and 1894, the city of Rochester, N. Y., put down a 38-inch steel pipe conduit made up of steel plates, ¼-inch and ⅜-inch metal. This line runs from their overflow No. 1, about two and one-quarter miles north of Hemlock Lake, to Mount Hope reservoir, a distance of twenty-six miles. The annual report of the city of Rochester for the year 1901 shows that as early as the year 1900 leaks in the line were discovered, and found due to corrosion of the steel plates, and that in January, 1901, other leaks began to develop. Later reports show that during the year, in seven separate excavations, fifteen holes, 1/16 inch to ¼ inch in diameter, were found, due to corrosion, and that more or less tuberculation was present along the joints and around the rivet heads. One sheet alone was found to contain more than five hundred pits about ⅛ inch in diameter by 1/16 inch deep. A careful examination of the interior of this steel pipe indicated that the cause of the corrosion was not confined to the presence of certain active elements in the soil. Later reports indicate that during 1902 further investigation showed that a great many more leaks had developed. The reports of the city of Rochester for the years 1901 and 1902 contain interesting notes regarding the investigations made by eminent engineers. Attention is particularly directed to the report of Professor F. L. Kortwright of West Virginia University. The experience of Rochester is interesting along the line of investigation as to the causes of corrosion of steel pipe as will be seen by any one interested enough to read in full the report of Professor Kortwright. It the case of this line of pipe every care was taken in the selection of the material.

The coating of the pipe was prepared after a formula by Professor Emil Kuichling and applied in a most careful and approved manner.

As a general proposition, it seems to be now conceded that on an average steel rusts at least 25 per cent more rapidly than cast iron; and when the relative thicknesses of riveted-steel and cast iron pipe are considered, it is readily seen that cast iron pipe will prove by far the more permanent. Then, again, the increased friction in riveted-steel pipe reduces by 10 to 20 per cent the flow of water, as compared with cast iron pipe of the same diameter.

POSSIBILITES FOR TURPENTINE IN NORTHWEST.

L. W. Hawley, expert on wood distillation for the Forest Service, has just left Washington, for Oregon, Washington, Montana, and Idaho, to investigate the possibilities of a future turpentine industry in the northwestern portion of the United States.

Mr. Hawley has taken with him a small distillation apparatus, which he will set up at various places in these States, distilling the different woods to determine their value in the production of turpentine. In this manner an accurate idea of the yield of extracts from the various woods can be obtained, and samples of the material will be sent to Washington for analysis and estimation of its value for use in paints, varnishes, and other naval stores.

There are at the present time in the Northwest, several wood-distilling plants, which are producing various grades of turpentine, wood-preserving oils, and materials of a similar nature. It is believed that a careful study of existing conditions in this section will yield results which will give an accurate idea of the possibility of utilizing the enormous quantity of sawmill refuse now going to waste.

WATER POWER.

In his address at the conference on the conservation of natural resources, H. St. Clair Putnam said:

"Where power is derived from water, winds and tides, only energy otherwise wasted is used. The energy thus extracted is added to our assets instead of being a permanent loss as is the case with the combustion of coal. In the aggregate the available water powers of the nation greatly exceed the present power requirements, but unless there is some curtailment in the rate of our development, our water-power resources will not of themselves solve the problem of our future supply of power. The power of Niagara Falls has been estimated, by Prof. W. C. Unwin, at 7,000,000 horse-power. A partial estimate of the water powers of the upper Mississippi River and tributaries places the available water power at about 2,000,000 horse-power. The southern Appalachian regions can furnish a minimum of nearly 3,000,000 horse-power. Both of these estimates can be greatly increased by including the use of regulation reservoirs and auxiliary steam plants. The water powers of New England are more fully developed than elsewhere in the country, though much remains yet to be done. In the Rocky Mountains and the far West there are immense water-power possibilities; in the State of Washington alone there are 3,000,000 horse-power available. It is probable that the water power in the United States exceeds 30,000,000 horse-power, and under certain assumptions as to storage reservoirs this amount can be increased to 150,000,000 horse-power or possibly more.

"Using the smaller figure of 30,000,000 horse-power as an illustration, to develop an equal amount of energy in our most modern steam-electric plants, would require the burning of nearly 225,000,000 tons of coal per annum, and in the average steam-engine plant, as now existing, more than 600,000,000 tons of coal, or 50 per cent in excess of the total coal production of the country in 1906. At an average price of $3 per ton, it would require the consumption of coal costing $1,800,000,000 to produce an equivalent power in steam plants of the present general type.

"During the past few years, there has been renewed interest in water powers on account of the practicability of their use for the generation of power, and the electrical transmission of this power to distant markets. The great hydro-electric development at Niagara was the first large enterprise of this character, and has demonstrated its practicability. The census of 1905 gives a partial list of long-distance hydro-electric plants developing power aggregating 600,000 horse-power, and this list can now be largely increased. Our most desirable water powers are being absorbed rapidly, and it becomes important, therefore, for us to take stock of our water resources and formulate plans for their control and proper utilization.

"In the improvements that have been made on navigable rivers, too little attention has been given to the development of the incidental water powers. On some waterways, as in several instances on the Mississippi, immense sums of money have been appropriated and expended on especially difficult portions of the river. If this money could have been made available in large amounts, instead of by driblets over periods of many years, water powers of great value could have been developed, and the navigation effectively and permanently improved. Unfortunately this has not been our policy. Too often the appropriations have been inadequate for carrying out the work as it should be done, and frequently the work has not followed any well-digested plan.

"With the data at hand, it is impossible to make an accurate estimate of the amount of power that can be developed incidentally to river navigation. A partial estimate of the power developed at existing Government locks and dams places the amount at 1,600,000 horse-power. This is based on

the mean low-water discharge for three months. This subject should receive careful consideration. Improvements in navigation should be made only after thorough study of the possibilities of power development. On the other hand, many water powers are on streams that are navigable, or are capable of canalization, and these streams should be developed for power purposes only after careful examination has been made of the possibilities of the stream forming a link in the system of inland waterways.

"The flow of water in many streams annually fluctuates between wide limits. The low-water periods limit the profitable water-power development and the high periods often cause disastrous floods. On most streams the average rate of flow for the year is many times the minimum flow. It is possible in some cases to utilize a flow approximating the average by constructing controlling reservoirs on the headwaters of the stream. Our Great Lakes form a natural reservoir of this character for the Niagara River. The upper Mississippi has great natural reservoirs which assist in regulating its flow, and which easily can be made very effective in its control. The notable floods of the Ohio River can be greatly reduced by the construction of controlling reservoirs on its headwaters, which will result in the saving of millions of dollars now annually wasted. On a stream which I recently investigated, the minimum flow furnishes but 200 horse-power. The construction of a storage reservoir increases the continuous twenty-four-hour power that can be utilized to 8,000 horse-power. If storage reservoirs could be constructed on the Susquehanna River, upon which a great water-power development is now in course of construction, so as to obtain a uniform flow throughout the year, the available power at this site would be increased from a minimum of 30,000 horse-power to 200,000 horse-power. While it is impracticable to construct reservoirs capable of holding back all flood waters, it is nevertheless certain that material gain would result from well-directed efforts along the lines suggested.

"In many cases water could be utilized for developing power on the headwaters of the streams without injury to the irrigation interests, as is illustrated by the excellent work now being done by the Reclamation Service. The development of water power will introduce another party whose self-interest dictates the use of every available method of preserving the volume of water supply, its continuity and regularity of flow.

"Where it is necessary to place a dam across a stream to develop power, the slack water so produced, with the addition of locks, renders otherwise impassable stretches of river available for navigation. Every water-power development is vitally interested in obtaining a uniform flow of water. This exactly meets the requirements of navigation. The approximate realization of regularity of flow can be attained only by the construction of headwater-regulating reservoirs and the preservation of our forests. Every water course that is improved for the production of power and for navigation produces, therefore, vigorous self-interested allies in the cause of forest preservation, headwater regulation, and the maintenance of conditions which are favorable to both interests.

"Heretofore, canals built for transportation purposes have not been used, to any great extent, for the development of power. In some cases this has been on account of the limited supply of water, but more frequently it has been due to the great difficulty experienced by the animals in towing boats against the rapid current produced in the canal by the flow of water to the water-wheels. With electric towing, the increase in the rate of current flow introduced by the development of water power on the canal is not a serious impediment to navigation.

"In addition to their reserve function in time of low water or flood, auxiliary steam plants and interconnected plants are valuable as insuring the continuity of power supply. If the lines are run overhead, as they must be for long-distance transmission in the present development of the art, all electric transmission plants are subject to occasional short interruptions due to storm, lightning, or malicious mischief. It is economical and desirable to tie together two or more plants, thus greatly increasing the reliability of service. If one plant or transmission line fails, the others can be pushed to take the load. From an engineering standpoint, and from the standpoint of the engineer as well as the power producer, this method of operation has great advantages.

"Power and transportation are the two great physical bases upon which modern industrial development rests. Without power, our methods of transportation must revert to a level with those existing in China. Up to the present time, while Nation and State have regulated, and in some degree aided, in the development of transportation, the power resources of the country have been utilized or wasted by the private individual and the corporation with little hindrance, and still less assistance from the constituted authorities. Next to individual enterprise, the most essential factor in the development of our national resources is wise governmental regulation, so applied as to insure the vigorous working of individual initiative, and at the same time prevent the waste by individuals of that which is vital to our national welfare, and to secure in the utilization of our natural resources the highest practicable degree of economy which scientific knowledge and engineering skill can attain."

THE RENTAL VALUE OF A POWER PLANT.

The rental value of a power plant, according to a paper by Chas. T. Main, depends upon its character and efficiency to produce power cheaply. The cost of producing power in small amounts is very much greater than in large amounts, and the amount which the lessee should pay may be obtained in comparison with the cost of producing the amount of power required with a reasonably efficient plant with steam power or by some other means. Thus, supposing the power to be rented is water-power and plant, its value can be determined by estimating the cost of producing a uniform power by water-power, supplemented by steam power if necessary, and comparing the cost of producing the same amount of power by steam power alone, in each case adding such charges as the lessee is to assume. The difference, if in favor of the water-power, will represent the value of the power for the length of time the estimated cost covered.

If the power plant be a steam plant, it is possible that it has no rental value; that is, it may be so wasteful that it would pay to replace or change parts of it to bring it into an economical state. If it is an economical plant, and is to be run by the lessee, he should pay such rent as will cover depreciation and a fair rate of interest, and assume repairs, insurance, and taxes, or pay enough rent to cover them. In the same way, if power is sold the lessee, the proper amount to pay per horse-power per year will vary with the amount which he requires.

As the amounts of power grow smaller, the cost of producing it is larger, and therefore a larger price per horse-power per year must be paid. The charges for small amounts of power seem to vary from $50 to $100 per horse-power per year; but each case should receive its careful attention.

Approved Electrical Devices

This department from time to time will contain an illustrated description of all fittings approved by the Underwriters' National Electric Association.

RHEOSTATS.

"Compensaic" auto-transformer with knife-switch designed to furnish 14, 40, or 60 Amp. to the lamp of moving picture machine outfits, 110 or 220 volts, A. C. Approved April 13, 1908. Manufactured by

Fort Wayne Electric Works, Fort Wayne, Ind.

ROSETTES, FUSELESS.

Two-piece fuseless rosette, cleat type, 3 A., 250 V., Cat. No. 310. Approved April 13, 1908. Manufactured by

E. H. Freeman Electric Co., Trenton, N. J.

SOCKETS, STANDARD.

Bryant Brass Shell, key and keyless. Cat. Nos. 9,386, 9,392, 50,760, 50,768, 99,386, 99,392, 43,389, 43,390. Fixture sockets, 1,317 to 1,320, inclusive; "Security Snap," Nos. 44,147 to 44,152, inclusive, and 44,814, 44,815. "New Wrinkle," Nos. 59,480 to 59,487, inclusive. Also above types with shade holders attached. Twin socket, Cat. No. 46,750, for use on fixtures only. Approved April 9, 1908. Manufactured by

Bryant Electric Co., Bridgeport, Conn.

SOCKETS, STANDARD.

"Perkins" brass shell, key and keyless, Cat. Nos. 9,386P, 9,392P, 50,760P, 50,768P, 59,480P to 59,487P, inclusive. Also above type with shade holders attached. Approved April 13, 1908. Manufactured by

Perkins Electric Switch Mfg. Co., Bridgeport, Conn.

SOCKETS, WEATHERPROOF.

P. & S. Weatherproof Sockets, 3 A., 250 V. Pendant style, porcelain shell, Cat. No. 116. Composition shell, Cat. Nos. 60,666 and 60,666A. Bracket style, porcelain shell, Cat. Nos. 0-116½ and 116½. Pendant style, for festoon work, Cat. No. 418. Approved April 13, 1908. Manufactured by

Pass & Seymour, Solway, N. Y.

LAMP GUARDS.

"Standard" adjustable lamp guard, with or without spiral safety cushion. Approved Apr. 28, 1908. Manufactured by

Standard Wire Co., New Castle, Pa.

CONDUIT, LINED.

Approved Apr. 24, 1908. Manufactured by

Sprague Electric Co., 527 W. 34th St., New York, N. Y.

CONDUIT, UNLINED.

"Loricated" and "Galvaduct." Approved Apr. 27, 1908. Manufactured by

Conduit Company, Ltd., Toronto, Ontario, Canada.

FUSES, CARTRIDGE ENCLOSED.

"Arkless," National Electric Code Standard. All capacities, 250 and 600 volts. Approved Apr. 29, 1908. Manufactured by

The Detroit Fuse & Mfg. Co., 40-46 Champlain St., Detroit, Mich.

LAMP GUARD.

"Benjamin" portable lamp guard, 16 C. P., 250 V., Cat. No. 160-P. Wooden handle with fibre cage. Approved for use only in dry places. Approved Apr. 28, 1908. Manufactured by

Benjamin Elec. Co., 42 W. Jackson Blvd., Chicago, Ill.

RECEPTACLES, STANDARD.

"Tregonning" sign receptacles, Cat. Nos. 300, 301, 302, 3A, 250V. Approved Apr. 24, 1908. Manufactured by

Tregonning Electrical Mfg. Co., 224 High Ave., S. E., Cleveland, Ohio.

MISCELLANEOUS.

Motor driven cash register for 110 and 220 volts, A. C. or D. C. (Maximum current, 3A.) Motor mounted on register frame and enclosed in register case. Connection to supply circuits by means of approved reinforced portable cord and approved attachment plug. Approved May 14, 1908. Manufactured by

The National Cash Register Co., Dayton, Ohio.

RECEPTACLES, STANDARD.

"Paiste" Receptacles, 3A, 250 V. Sign receptacles, Cat. Nos. 1700, 40488 and 46749. Cleat type, Cat. Nos. 9402, 9403, 50715 and 11221. Moulding type, Cat. Nos. 47567 and 47568. Approved May 11, 1908. Manufactured by

H. T. Paiste Company, 32d and Arch Sts., Philadelphia, Pa.

"Paiste" Wall Sockets, mounted on PK or KW link fuse rosette bases, 2A, 125 V. Brass shell, key or keyless. Cleat types, Cat. Nos. 50730, 50733, 34194, 34197. Concealed types, Cat. Nos. 50729, 50732, 34193, 34196. Porcelain shell, Cat. Nos. 38135, 38136, 38394, 38395. Also above types with shade holders attached. Approved May 12, 1908. Manufactured by

H. T. Paiste Company, 32d and Arch Sts., Philadelphia, Pa.

SOCKETS, STANDARD.

"Perkins" Brass Shell, key and keyless, Cat. Nos. 9386P, 9392P, 50760P, 50768P. "New Wrinkle," 59480P to 59487P, inclusive. Also above types with shade holders attached. Approved May 8, 1908. Manufactured by

The Perkins Electric Switch Mfg. Co., Bridgeport, Conn.

SOCKETS, WEATHERPROOF.

"Cole" Composition, pendant. Cat. No. 60666, black or brown finish, 3A 250V. Approved May 14, 1908. Manufactured by

Henry Cole & Co., Boston, Mass.

SWITCHES, DOOR.

3A, 250V. Approved May 9, 1908, for use when mounted in approved switch box. Manufactured by

Hart & Hegeman Mfg. Co., 342 Capitol Ave., Hartford, Conn.

3A, 250V. Approved May 9, 1908. Manufactured by

Perkins Electric Switch Mfg. Co., Bridgeport, Conn.

SWITCHES, KNIFE.

"American" Types A and B; 125, 250 and 600 volts. All capacities, with or without extensions for cartridge fuses. Approved May 7, 1908. Manufactured by

American Electric Switch Co., Springfield, Mass.

SWITCHES, PUSHBUTTON, FLUSH.

Single pole, 3-way and 4-point; 10A, 125V; 5A, 250V. Double pole, 10A, 250V. Approved May 13, 1908. Manufactured by

C. S. Knowles, 7 Arch St., Boston, Mass.

SWITCH BOXES.

"Fancleve" cast iron switch boxes. For metal conduit. Cat. Nos. 351, 501. For flexible tubing, Cat. No. 651. Approved May 5, 1908. Manufactured by

John L. Gleason, 290 South St., Jamaica Plain, Mass.

WIRES, RUBBER COVERED.

Marking: Two red threads woven into braid, crossing each other. Approved May 11, 1908. Manufactured by

Acme Rubber Mfg. Co., Trenton, N. J.

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R. J. DAVIS
A. M. HUNT
E. M. SCRIBNER
C. L. CORY
E. B. STRONG

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VOL. XX JUNE 6, 1908 No. 23

EDITORIAL.

RENEWED CONFIDENCE.

A sudden freshet in one of the feeders of a great reservoir finds the weak place in the restraining dam, and the water conserved for power purposes thus becomes a destructive flood. If the structure be well built, on a firm foundation, with sufficient outfall, the damage will be limited to that done by the head of water above the break. But even this is often so great that whole villages and towns are swept away and their inhabitants ruined, thankful to be alive. Fear and anxiety so blind them that they do not see beyond the present moment, nor realize that with renewed hope this calamity may eventually be a benefit. For the loam filched from fertile fields is deposited on new ground as the flood subsides. Old barriers to progress are swept away, leaving a smoother, deeper channel. Unknown placer mines may be uncovered on the land stripped of its soil and its owner enriched thereby. Investigation shows also that the greater part of the strong dam still stands unharmed, as a basis for a bigger power-plant. In time the scars become healed and the community more prosperous than before, profiting by the experience gained in the disaster.

Thus it seems with regard to the recent break in the financial structure, occasioned by speculative excesses. Broken public confidence occasioned a flood that engulfed business stability in its whirling eddies. Houses with insecure foundations were overthrown, and some of the strongest tottered. Thousands of men were thrown out of employment. During the past winter the distress was widespread, but with the spring came hope, and with hope, confidence. The bulwark of our natural resources was unimpaired, and on it as a foundation, a new financial structure has been reared. Contrary to the hopes of even the most sanguine, the recovery of financial integrity has been more rapid than the decline following the discovery of its former unsoundness. Money is once again flowing in its normal channels. Deferred dividends are being paid, loans are being renewed, bank clearings are increasing, and those out of employment are being sought to take up suspended work. New vitality has been infused during the period of enforced rest, and men are now better prepared for the future. Engineering progress has continued during business depression, and methods neglected in busier times have been successfully developed during this interval.

The indicator card of progress can always be determined from the state of the iron market and from power development. They are the barometers that foretell the advent of adversity or prosperity. The decline in the demand and production of iron, beginning late last October, was simultaneous with the financial panic, and their continued depression have been coincident. Consequently the announcement that the Illinois Central R. R. Co. has placed a contract for 52,000 tons of steel rails, costing $1,456,000, will stimulate the return of prosperity. Steel mills will reopen, and it is said that immediate work is to be given to 2,000 skilled men who have been idle for some time past. This is but one of several similar significant announcements.

The power possibilities are no less promising, especially since the needed check on heedless waste has been universally suggested by the Conservation Conference at Washington. In response to the summons of the President, forty-one Governors met together with the leaders of representative bodies of trade, agriculture, engineering, and financial interests. While such a meeting possesses no legislative power, yet it has awakened the people of the Nation to a realization of the danger that threatens them, and this public opinion will undoubtedly re-act upon Congress, so that we may hope for a Federal commission on the conservation of the natural resources that will advise and confer with the various state commissions. The consequent uniformity of national and state laws cannot but prove a benefit to the power industry, at present amounting to over thirty million horsepower.

Misdirected energy, whether of power, water, money, or human vitality, only retards progress, and the sooner the necessity for its centralized direction becomes recognized, the more rapid will be the rate of man's work. Thus profiting by past mistakes and courageously expressing our faith in the ultimate outcome, success will reward our efforts.

EXAMINATION FOR ELECTRICAL AND MECHANICAL DRAFTSMAN.

The United States Civil Service Commission announces an examination on July 22-23-24, 1908, to secure eligibles from which to make certification to fill one or more vacancies in the position of electrical engineer and mechanical draftsman, at an entrance salary of from $100 to $200 per month, in the Reclamation Service, and vacancies requiring similar qualifications as they may occur. Eligibles from this examination may be appointed as electrical engineers or assistants for the design, installation, or operation of hydro-electric and steam power plants in the West, or as mechanical draftsmen for office work and drafting in connection with preparation of plans. The examination will consist of: Mathematics, applied mechanics, mechanics of materials (pure mathematics through calculus, computations of stresses in metal beams, structures, etc., tensile and compressive strength of concrete, etc.); hydraulics (computation of horse-power, plan of connection, water-wheel design, arrangement of pipe, friction losses, discharge of orifices, velocity head, etc.); theory and practice of electrical engineering (design, construction, and operation of modern alternating-current power transmission plants); steam turbines and engines; drawing and design (layout of hydro-electric and steam-power plant, buildings and machinery); training and experience (rated on application). Competitors may also be examined in one or more of the following-named optional subjects: 1. Centrifugal pumps (design and installation); 2. Turbine water wheels (design and installation); 3. Gas engines. These optional subjects will be given on the third day. Two hours will be allowed for each optional subject. Applicants must indicate in answer to question 1 of application Form 1312 which, if any, of the optionals named above they desire to take.

EXAMINATION FOR FIRST-CLASS STEAM ENGINEER.

The United States Civil Service Commission announces an examination on July 1, 1908, to secure eligibles from which to make certification to fill a vacancy in the position of assistant engineer, at $1,400 per annum, in the office of the Secretary of Agriculture, and vacancies requiring similar qualifications as they may occur.

Consul Frank S. Hannah reports that in some tests made in March in a factory at Magdeburg-Buckau, Germany, by an expert from Darmstadt, a new world record was established for "locomobiles" in the production of a maximum amount of steam by a minimum consumption of coal. The engine used to make the experiments was a newly constructed 100-horsepower patent steam "locomobile" (traction or stationary engine), with piston-valve distribution and use of superheated steam. The tests established that for each unit of horsepower, 8.66 pounds of steam and 1.042 pounds of coal were consumed per hour.

PERSONAL.

A. Neugard, of the Henry Neugard Company of Chicago, has been in San Francisco during the past week.

M. C. Crawley, electrical engineer for the Union Oil Co., has been in San Francisco during the past week.

Geo. H. Scoville of the Dean Electric Co., went South after his return to San Francisco from the Northwest.

C. H. Pennoyer, Pacific Coast Manager National Conduit and Cable Co., has been seriously ill, due to blood poisoning after an operation.

G. C. Pierce has been renewing friendships among former associates in the electrical trade on the Coast. While on health and pleasure bent, he is representing the McGuire-Cummings Mfg. Co., of Chicago.

TRADE CATALOGUES.

"Vox Populi," from the Wagner Electric Manufacturing Company, of St. Louis, is a neat testimonial booklet, detailing experiences with Wagner single phase motors for all classes of service.

The Sprague Electric Company is sending out a folder describing its new Stamped Steel Octagon Box No. 6250. This box is a departure from former practices in the stamped steel line, and undoubtedly will be welcomed by the electrical trade. Folder No. 431 tells the story concisely, and will be sent to any one requesting it.

The Sprague Electric Company is sending out a series of attractive blotters to advertise its well known and popular electric fans. This company has a line of direct and alternating current fans adapted for all requirements—electric fans for everybody everywhere. Catalogue No. 317 describes the fans, and may be obtained by addressing the company.

Crocker-Wheeler Co. of Ampere, N. J., send Bulletins Nos. 96, 101, 102, 103 and 104. No. 96 is devoted to alternating current, switchboard panels for two phase, four wire and single phase ungrounded systems. No. 101 illustrates and describes Form D, machine belt type, direct current, motors 50 to 275 horsepower, and generators 45 to 225 kilowatt. Alternating current switchboard panels for two phase, four wire, and three phase three wire ungrounded systems, 1150 to 2300 volts are listed in No. 102. No. 103 is a reprinted article on "The Sanitary District of Chicago's Hydroelectric Development on the Chicago Drainage Canal." No. 104 details by picture and text the excellent features of Crocker-Wheeler's direct current railway generators.

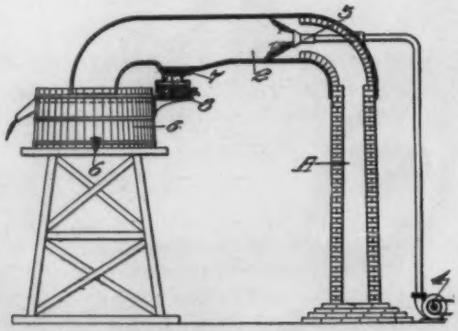
ERRATA.

In the article on "Inductive Interference With Telephone Circuits in Proximity to High Potential Transmission Lines." issue of May 23rd, page 318, column 2, line 39, 60000 should be $\frac{60000}{\sqrt{3}}$; on page 320, column 2, line 24, the word **manufac-** ... should be **microfarad.**

PATENTS

APPARATUS FOR CONDENSING FUMES AND GASES. 888,119. George C. Richards, Berkeley, Cal., assignor to Richards Gas & Fume Condenser Company, Oakland, Cal.

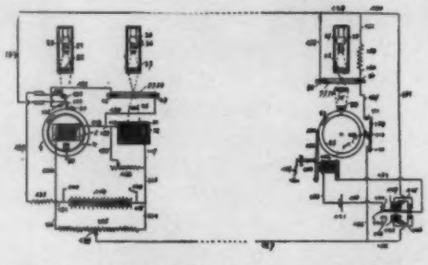
An apparatus for condensing vapors, said apparatus having in combination a vertical smoke-stack, a horizontal



pipe extension of the stack, said extension having a bend connecting with the top of the stack and said bend having double walls for protecting the bend from intense heat, a hydraulic jet entering the extension and discharging at a point in advance of the bend, and a tank into which the opposite end of the extension discharges.

AUTOMATIC PHOTO-TELEGRAPH. 888,098. Arthur Korn, Munich, Germany.

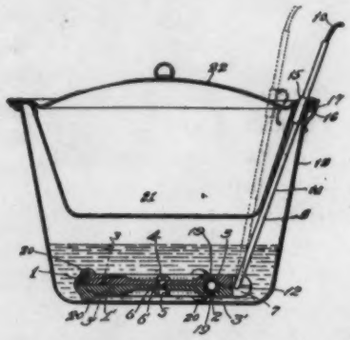
In a photo-telegraphic system, the combination with a circuit at the transmitting station and comprising two selenium cells in series, of means for exposing one of said two selenium cells to the light passing from a constant source of light through a moving point on a transparent original, a sensitive film or the like at the receiving station, a shunt line leading from said circuit at a point between the two



selenium cells to the receiving station and back to the circuit at a point outside the two selenium cells, means inserted in said shunt line and adapted to control the exposure of the other selenium cell to a constant source of light in accordance with that of the first selenium cell, and means inserted in said shunt line and adapted to control the exposure of a moving point on said sensitive film or the like to a constant source of light in accordance with that of the first selenium cell.

ELECTRIC HEATER AND COOKER. 887,923. Ella M. Crandall, Dolgeville, Cal.

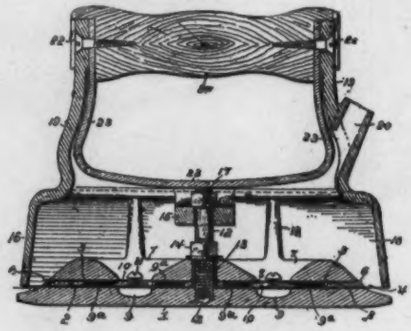
Two complementary insulating plates each recessed on one side to receive a heating element and each provided with parallel slots in the peripheres of the plates and communicating with the ends of the grooves, insulated terminals in said slots having angularly-bent ends in said



grooves, a heating element in the recesses of said plates, and means for fastening the plates together.

ELECTRIC HEATER. 887,871. Clarence L. Taylor, Alliance, Ohio.

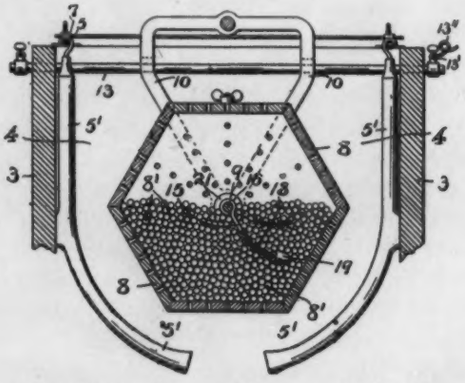
An electric heater, comprising three super-imposed plates insulated from each other, the intermediate plate having a series of openings, resistance coils disposed in



the openings in the intermediate plate and having their outer convolutions in electrical contact with said plate, and means for connecting the terminals of leading-in wires to the inner convolutions of said coils, whereby said coils are included in series with each other.

ELECTROPLATING APPARATUS. 888,068. John T. Daniels, Newark, N. J., assignor to The Hanson & Van Winkle Company.

In an electroplating apparatus a tank adapted to contain an electroplating solution, a rotatable container,



means to support said container in said tank, means to rotate said container, an anode, means to support said anode within said tank, a cathode element comprising a flexible portion and, at its free end, a part heavier than said portion, and means to support said cathode within said container.

INDUSTRIAL

WAGNER ELECTRIC GROWTH.

In 1890, two young electrical engineers, Mr. H. A. Wagner and Mr. Ferd. Schwedtmann, appreciating the fact that at that time there was no satisfactory alternating current fan motor on the market, began in a small shop, in a very small way, the manufacture of desk fans. Strict attention to business and a careful conservation of their energies, and good fortune in getting the repair work of a large central station,

WAGNER FACTORY 1890.

WAGNER FACTORY 1891.

WAGNER FACTORY 1893.

WAGNER FACTORY 1896

WAGNER FACTORY 1900.

attracted other capital toward them. These two young men conducted their fan business in a small store, cut of which is shown herewith. After having been in business a year, it very soon became apparent that additional capital was desirable; this was forthcoming, and the plant shown in 1891 was the result, the Wagner Electric Manufacturing Co. being then incorporated.

It was repairing transformers that first showed the Wagner Company the faults of other transformer manufacturers, and how to remedy them. Its research and development of this line of apparatus led it into new lines of thought and new forms of construction, both mechanically and electrically. This naturally led up to transformers of their own design, and the introduction of the Transformer Department rapidly used up all available space in this 1891, three-story structure, which necessitated increasing the plant 200 per cent, at which time the building took the form shown in photograph 1896.

The company was successful; made money from the start, and received great impetus from the proper organization of factory and selling forces. The results of the work in the Experimental Department here began to make themselves felt, in the introduction of the first successful single phase motor ever put upon the market. The success with which this motor was received made necessary the further addition to these buildings, as shown, in 1900.

In 1896 and 1897, the company further extended its line to the manufacture of direct-current motors and generators, and was very successful in marketing this product. This direct-current line, however, was soon crowded out, owing to the large demands made upon factory capacity by the company's older line of manufacture.

In 1896, several central station clients of the company enlisted its assistance in remodeling and improving their alternating current switchboard meters, these instruments having proven both unreliable in operation and very fragile. This practically forced the Wagner Company to design a line of such devices, and this line rapidly grew beyond the utmost expectations, and lent its part in compelling the company to provide an absolutely new plant for the proper handling of the business.

The old plant of the Wagner Company, together with the adjacent ground, which was used for storage purposes, was outgrown three years ago, when a careful search was made throughout the city of St. Louis and the surrounding country for a favorable factory site, which would be suitable for the erection of an entirely new and modern plant.

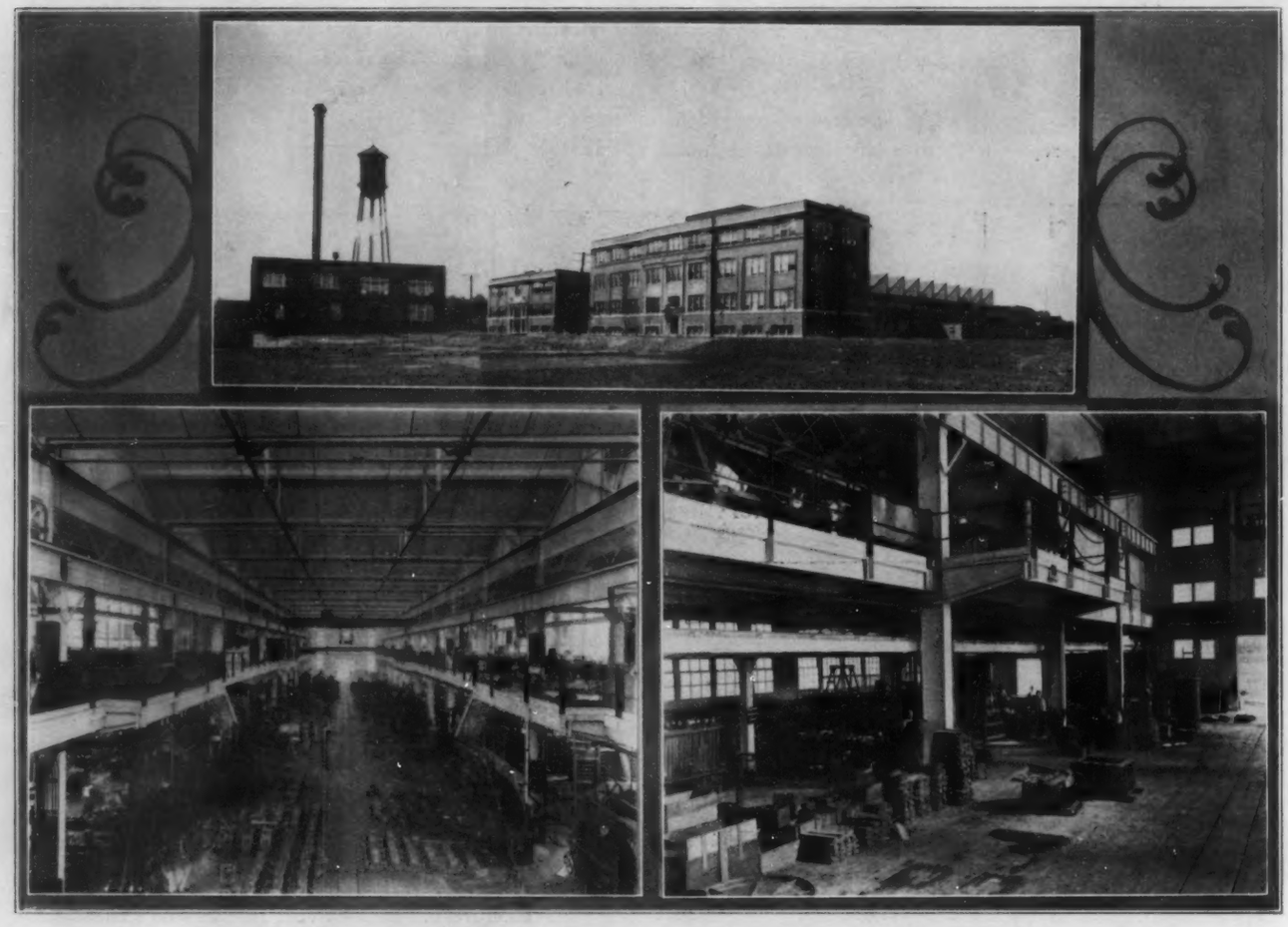
The company's new plant is located at Hillside Station, and is about 800 feet west of the city limits. The site comprises about fifteen acres, and is admirably located as regards sunlight and fresh air, and has unsurpassed shipping facilities.

The entire layout is arranged so that as the business expands, new factory units can be added and the work reclassed. A particular feature which is producing great results in the layout of this plant, is the system of sub-ways which connect the various buildings and departments.

The heating system is hot water under forced circulation, with temperature controlled by engineer at the power plant. The heating is graduated to the outside atmospheric conditions by manual regulation, by the engineer in charge. This heating installation is very complete, and is guaranteed by the manufacturers, the Evans-Almirall Co., to keep the buildings at 70 degrees.

An independent system of drinking water pipes is carried throughout the plant, and drinking water is supplied under a continuous circulation at a temperature of 60 degrees, this being maintained by a refrigerating machine driven by a Wagner single phase motor. The temperature regulation of this machine is entirely automatic. Drinking fountains are located at sufficiently frequent and convenient points throughout all buildings to bring a supply to within fifty feet of every employee, the water coming up in a mushroom-shaped cup, provided with a drain, so that a workman may obtain a drink from a stream of water under pressure, without fear of contamination, as no cups are used, the stream of water only being brought in contact with the lips.

The equipment for fire protection consists of a 75,000-gallon steel tank, 100 feet in the air, located immediately over a 150,000-gallon surface storage reservoir, this reservoir being located adjacent to the power plant. A fire pump, located in a pump-house adjacent to the reservoir, is kept under steam at all times, for service, should a fire break out. The system of sprinkling plugs located throughout the grounds is very complete, each one being a twin plug, around which is built a small fire house. Each house is equipped with axes, lanterns, hose and nozzle for quick action. A fire department has been organized and drilled for service should a fire break out at any time during factory hours. In addition to the fifteen twin plug stations, the entire factory is equipped with an interior system of water pipes with sprinkler heads. The outside water supply to fire pump consists of an eight-inch connection with service pipes of the St. Louis County Water Co., thereby insuring an adequate supply of water at high pressure at all times.



POWER HOUSE AND ADMINISTRATION BLDG., WAGNER ELEC. MFG. CO.
MACHINE SHOP. TRANSFORMER ROOM.

The view of the main machine shop shows the interior to be 100x312 feet, the galleries being 25 feet in the clear. The building has a sawtooth roof, the vertical panels facing the north. The building is served through its entire length by a ten-ton crane, operated by three-phase Wagner motors. The space underneath the galleries and the galleries proper are served by twenty-eight hand cranes, each one of which serves a limited area. This shop is equipped with the most up-to-date machinery known to the trade.

An interior view of a corner of the transformer shop shows the heavy steel construction, together with loading platform, so that the overhead crane may serve the gallery. The heavy and large transformers are built on the main floor of this building, the coil winding and insulation processes being conducted in the gallery.

As the apparatus of the company steadily underwent complete evolution, so also did the active personnel of the staff. From a business of small proportions calling for limited capital, and the personal attention only of its organizers, the corporation demanded and commanded the support of a strong coterie of St. Louis financiers on the financial side, and widening staff of engineering and executive heads on the administration side.

It is a notable fact that the Board of Directors of the company is to-day probably the most representative of any corporation in the city of St. Louis, comprising the active spirits of the city's foremost bankers, as shown in the following list:

Mr. S. M. Dodd, capitalist, President. Member of of the Board of the National Bank of Commerce, Commonwealth Trust Co., and Mercantile Trust Co.

Mr. James W. Bell, member of Board of National Bank of Commerce, and member of Board and Manager of Savings Department of Mercantile Trust Co.

Mr. J. C. Van Blarcom, President National Bank of Commerce.

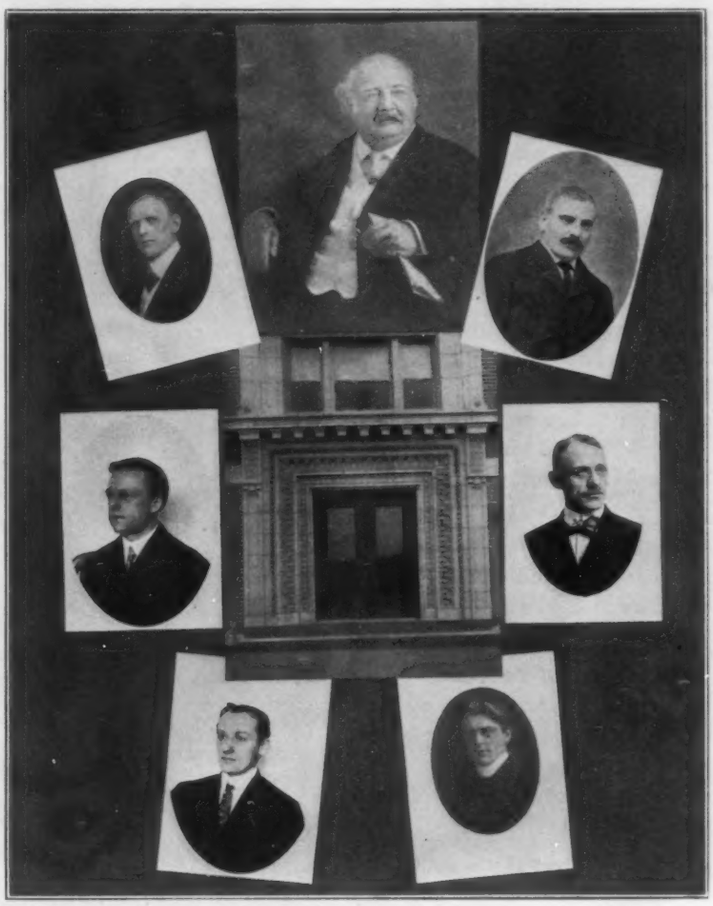
Mr. Thos. H. West, President St. Louis Union Trust Co.

Mr. Jas. Campbell, capitalist. Controlling spirit of numerous large corporations, including railways, mining properties, and many others. President of the Telluride Power Trans. Co.

Mr. Albert Blair, Secretary and Counsel. Director and attorney for numerous industrial companies.

Mr. W. A. Layman, Vice-President and General Manager.

The engineering and administrative staff has undergone gradual evolution also. The directory heads have changed from time to time, active leaders in the business, seeking other fields, until today the active organization rests largely upon men who have been developed in the company's own plant, all of whom are well known in electrical fields.



M. S. DODD, PRESIDENT.
W. A. LAYMAN, V. P. AND GEN. MGR. W. S. THOMAS, TREAS.
V. W. BERGENTHAL, ASST. MGR. C. T. LORD, SUPT.
A. TIMMERMAN, CH. ENG. W. ROBBINS, ASST. GEN. MGR.

W. A. LAYMAN, VICE-PRES. AND GEN. MGR. Mr. Layman is a graduate of the Rose Polytechnic Institute, having been graduated in 1892, taking a degree of B. S. In 1894 he was given the degree of M. S. In 1896, E. E. Mr. Layman is a full member of the American Institute of Electrical Engineers, and past president of the Engineering Club of St. Louis. Mr. Layman began his work with the Wagner Elec. Mfg. Co. in September, 1892, as draftsman, serving successfully as the head of the Engineering Dept., Asst. Superintendent, Asst. Manager, and as General Manager of all departments since 1902. Mr. Layman was elected Vice-President of the organization in 1908.

W. ROBBINS, ASST. GEN. MGR. Mr. Robbins is a graduate of the University of Michigan, class of 1896, having taken the electrical engineering course. Immediately after his graduation, he entered the organization of the Western Elec. Co. of Chicago, having served in almost every capacity from salesman to Superintendent of Construction. Mr. Robbins also served two years on the manufacturing committee of the Western Electric Co., leaving that company in July, 1906, to associate himself with the Wagner Co., with headquarters in the main office at St. Louis.

W. S. THOMAS, TREASURER. Mr. Thomas is a graduate of the Illinois State University, having had fourteen years' experience as the manager and financial head of one of the largest wholesale coffee establishments in the West. Mr. Thomas' connection with the Wagner Company dates from December, 1907.

A. H. TIMMERMAN, CHIEF ENGINEER. Mr. Timmerman is a graduate of College City, of New York. B. S. in 1891, afterwards graduating from Cornell University; M. E. in E. E. in 1892, taking degree of M. M. E. in 1893. Mr. Timmerman was instructor of physics and electrical ebgineering in 1893-94 in the Washington University of St. Louis, and was Professor of physics and electrical engineering in the School of Mines and Metallurgy, University of Missouri, Rolla, Mo., from 1894 to 1899. In 1899 Mr. Timmerman entered the organization of the Wagner Company as Electrical Engineer, being made Asst. Superintendent in 1900, and Superintendent in 1902. Mr. Timmerman succeeded to the position of Chief Engineer in 1908.

C. B. LORD, SUPERINTENDENT. Mr. Lord was associated for seven years with the General Elec. Co. as General Foreman of the Train Control Dept. and Test Dept. After leaving the General Electric Co., Mr. Lord served as assistant superintendent with the Victor Talking Machine Co., of Camdem, N. J., associating himself with the Wagner Company, December, 1906.

V. W. BERGENTHAL, ASST. MGR. SALES. Mr. Bergenthal graduated from the Electrical Engineering Dept. of the University of Wisconsin with the degree of B. S. E. E., in 1897, and completed a post-graduate course in 1898, receiving the degree of E. E. Immediately thereafter he entered the ranks of the Stanley Elec. Mfg. Co., at Pittsfield, Mass., where he spent several years in the various engineering and testing departments, until he became the designing transformer engineer. After filling this position for a year, he was transferred to their Chicago office, assuming the duties of Western Sales Engineer, and later on was made Asst. Manager of that office. In the fall of 1903, Mr. Bergenthal left the Stanley Co., going to the American Automatic Switch & Signal Co., as its secretary, resigning that position in November, 1904, to join the staff of the Wagner Electric Mfg. Co.

NEWS NOTES

ILLUMINATION.

Banning, Cal.—B. B. de Crevecoeur began work on excavation for the gas plant this week.

Madera, Cal.—John F. Beales, of Los Angeles, has arrived here and is looking over the field with a view of installing a gas plant.

Riverside, Cal.—Plans and specifications have been filed for the plant of the Banning Home Gas Company. J. R. Thompson, of Los Angeles, is the contractor, the contract price being $14,500.

Pasadena, Cal.—As soon as additional supplies arrive and are assorted, Manager C. E. Koiner expects to put a force of men to work altering and completing the municipal street lighting system here.

Globe, Ariz.—The Globe Electric Light & Gas Company passed into the hands of Russell Palmer, of New York, on June 1st. It is proposed by the new company to spend $150,000 in improvements at the plant.

Santa Monica, Cal.—The City Clerk will receive sealed bids up to June 15th for furnishing and placing ornamental iron posts and installing necessary lights and wiring along the ocean front walk, between Pier and Hollister Avenue.

Azusa, Cal.—The Interstate Gas Company announces that the contract for laying gas mains through the streets of Azusa has been let to a Los Angeles contractor, and that the work of piping the city will begin in time to insure gas by August 1st.

Placerville, Cal.—At the last meeting of the Town Trustees, the report of Engineer White on the proposed municipal electric light and power plant was submitted. After considering it the Board adjourned without taking any action. The matter will again be taken up at a meeting to be held during the coming week.

Redlands, Cal.—C. S. Chestnut, president of the Redlands Gas & Electric Company, has been at Colton, conferring with Seth Hartley regarding the purchase of the Colton gas plant, the plan being to establish a plant at Colton to supply gas to Riverside, Redlands, San Bernardino, Colton, and later to Highland. This will do away with local plants in these cities.

San Francisco, Cal.—A bill naming 85 cents per 1000 feet as the legal charge to be made for supplying gas during the next fiscal year has been passed to print by the Board of Supervisors. John A. Britton, representing the gas company, made an argument in favor of the higher rate, going into details to show that from the company's standpoint, the revenue which the Supervisors proposed to allow would not yield a fair rate of interest to the stockholders of the company. He pointed out that the price of oil had materially increased, and that much new machinery had been or would have to be acquired. He said that for rate-fixing purposes the company had practically accepted the figures of the city's experts, and that the only differences between the estimates of the company and those of the city's experts as to the cost of producing gas, were the amount to be allowed for depreciation and the amount that constitutes a reasonable interest on such an investment as a gas plant. He stood strongly for the two and one-half per cent which had been asked for to cover depreciation, saying that not a gas plant existed to-day that had any of the plant which it had forty years ago, except, possibly, it might be in the case of a few miles of pipes. He also said that with the equipment which the gas company had in this city five years ago it would be impossible to produce gas to-day and sell it for less than $1.50 per 1000 feet.

TRANSPORTATION.

Redlands, Cal.—The Home Gas & Electric Company has signed a contract to furnish power for ten years to the Redlands & Yacaipa railway to be built this summer.

Albuquerque, N. M.—Plans are being prepared to install an electric car line on the highlands. Col. D. K. B. Sollers, who started the project some time ago, is behind the present movement.

Long Beach, Cal.—It is reported that the Pacific Electric Company intends to extend its line from Long Beach to San Pedro via a private right-of-way, the Long Beach Harbor and Commercial Street.

Los Angeles, Cal.—An ordinance has been passed granting the Pacific Electric Railway Company permission to lay temporary tracks over certain streets while the bridge is being built over Arroyo de los Poses.

Oakland, Cal.—The Supervisors of Alameda County have decided to grant A. W. Maltby and Joseph Napthaly permission to construct and operate an electric railroad through the tunnel connecting Alameda and Contra Costa Counties.

Salt Lake City, Utah.—Work will be started next Monday by the Utah Light & Railway Company on the new car barn and plant at Fifth South and Sixth East Streets. This will involve an expenditure of $600,000. Of this, it is expected that the car barns proper, costing in excess of $300,000, will be completed by the end of the year.

The first shipment of steel rails for the Redlands & Yacaipa Mile High Railway, has arrived. C. S. Chestnut, who secured some of the franchises for the Redlands & Yacaipa Electric Railway and lines in this city in connection with George H. Dunn, says that they intend to use at once the franchise granted C. C. Haskell and recently transferred to them.

Los Angeles, Cal.—The Los Angeles Inter-Urban Railway Company has contracted with W. N. Crandall for doing the grading for the La Habra Valley line in Los Angeles and Orange Counties, consideration sixteen cents per cubic yard for excavation, forty cents per cubic yard for hardpan, forty cents per cubic yard for loose rock, ninety cents per cubic yard for hard rock.

WATERWORKS.

San Diego, Cal.—A complete water system will be put in at Imperial Beach.

Los Angeles, Cal.—Surveyors are engaged mapping out a route for a pipe line from MacGruder mountain to Hornsilver, Nev., to convey water to the new camp.

Santa Cruz, Cal.—The City Council has taken preliminary steps for bonding the city for $100,000 for a new bridge, and the expansion of the electric light system and water supply.

Phoenix, Ariz.—Sealed proposals are being received by the Board of Trustees of Greenwood Cemetery for the construction of a system of water works for the Greenwood cemetery.

Los Angeles, Cal.—T. J. English has purchased a tract of land three and one-half miles southeast of Chino, and is driving a well, installing a pumping plant and putting in pipe lines to all parts of the tract.

Santa Cruz, Cal.—The San Vicente Lumber Company, which is getting ready for the erection of a saw mill at the edge of the city limits, petitioned for water and for fire protection, asking that the mains be extended to the plant.

Jamestown, Cal.—The Tuolumne Water & Power Company have completed the survey in Jamestown for the eleven-inch pipe line, which the company will have laid between the App ditch and Main Street. The fall from the ditch is 307 feet.

Los Angeles, Cal.—Following the driving of another big twelve-inch well at Beaumont, and sinking of a large shaft in water-bearing lands north of town, contracts are being awarded for nearly five miles of flumes and cement mines, comprising the fourth unit of the Beaumont irrigation system.

Los Angeles, Cal.—The Board of Water Commissioners is receiving sealed bids for fifteen tons of pig lead for caulking in cast iron water pipe, to be delivered at the warehouse of the Water Department, within thirty days after award of contract. The Board is also receiving bids for 100 six-inch gate valves.

Kingman, Ariz.—J. W. Wood, foreman of the Santa Fe water service, has a gang of men at work on two big water tanks which the company is to build at this place. As soon as tanks are completed they are to be connected up with a water system through the yards, mains being laid from the tanks up to Fifth Street.

Oakland, Cal.—Contracts have been awarded to the United Iron Works of Oakland to construct two auxiliary salt water pumping plants, the water to be used for street sprinkling; the plant on the northeast arm of Lake Merritt to cost $450, and the plant on the northwest arm will cost $475. The city agrees to construct the pits.

Ocean Park, Cal.—Preliminary steps have been taken by the Board of Trustees for the extension of the salt water mains from Venice to other portions of Ocean Park, which at present do not have fire protection. The city has 4,000 feet of eight-inch pipe on hand, and this will be laid at once to extend the salt water mains to the northern part of the resort.

TRANSMISSION.

Eureka, Cal.—G. M. Scott claims 500 inches of water in "Old Mill Creek" for generating electric power and for other purposes.

Redding, Cal.—David E. Aldridge has appropriated 3,000 inches of water flowing in the bed of North Bear Creek for generating electricity for power, lighting and other purposes.

Sacramento, Cal.—The Great Western Power Company has filed an acceptance of the ordinance granting the company the right to plant its poles and towers and stretch its cables and wires in this county.

Pasadena, Cal.—The City Clerk is receiving bids for furnishing the city the following items: poles, triple braid, medium hard drawn, weather proof copper wire; cross arms, galvanized cross-arms, brass and carriage bolts.

Manhattan, Nev.—F. L. Sigel, of Denver, president of the California-Nevada Power Company, was here a few days ago and stated that the company's line will probably be extended into Manhattan and Round Mountain by fall.

Modesto, Cal.—A complaint filed in the Superior Court for condemnation of right-of-way shows that the Tuolumne Water Power Company, which filed articles of incorporation in this county on April 14th, has already begun work on the construction of its power line across Stanislaus County. The company is generating its power on the Upper Stanislaus, and will construct a power line on an air line through Calaveras, Stanislaus, San Joaquin, Alameda, and Santa Clara Counties to a point south of the Bay, and from there into San Francisco.

Bakersfield, Cal.—The Edison Electric Company's plant in the Kern River Canyon is now supplying all the power which the company uses in the southern part of the State, the other plants in the South being shut down. The reason given is one of economy. Sufficient power can be generated by the local plant so long as the present flow of water continues, and it is generated at the minimum cost. During the week the battleship fleet was in Los Angeles, the exceptional amount of work required of the cars and other users of electricity made it necessary to start up one of the other plants, and one or more of these Southern plants will be used this summer when the water in Kern River is low. There is much less water in the river now than last year at this time, and a considerable decrease is expected later on. So far, the power plant has not used anywhere near all the water available, and it is now generating 40,000 horse-power. To handle and care for the plant and do the necessary work of maintenance, twelve men are employed, or only one man to every 3,000 horse-power.

INCORPORATIONS.

San Francisco, Cal.—The Black Canyon Oil Company has been incorporated with a capital stock of $1,000,000 by W. H. Pabst, C. Withers, C. A. Davis, J. B. Batz, A. F. Rodgers, C. A. Slack and J. H. Jordan.

Bakersfield, Cal.—The Babcock Petroleum Company has been incorporated with a capital stock of $1,000,000 by F. W. Babcock, of Providence, R. I.; E. E. Powers, W. H. S. Welch, L. R. Powers and F. N. Notman, all of Los Angeles.

Pt. Richmond, Cal.—The Bay Shore Electric Light & Power Company has been incorporated with a capital stock of $500,000 by W. H. George, of San Francisco; M. R. Jones, of Martinez; A. E. Steinberg, of Port Costa; E. M. Downer and L. E. Hart, of Pinole.

OIL.

Sacramento, Cal.—Bids will be received at the office of M. J. Desmond, City Clerk, until June 8th, for furnishing the city water works, the city sewering pumping station, at Front and S Streets, city sewer pumping station at Front and U Streets, and the city garbage crematory in block bounded by V, W, Front and Second Streets, with fuel oil for a term of one year from date of approval of contract.

Stockton, Cal.—The Stockton capitalists who are interested in the oil fields of the Sunset district near Bakersfield, and who have incorporated under the firm name of the Gate City Oil Company, have received news that another rich well has been struck. The new well is now down 735 feet, and oil flows from the depths at the rate of 200 barrels per day. The quality being received is known as thirteen per cent gravity. The Stockton Company has secured a lease of twenty acres for fifteen years, and expects to bore eight wells on the territory. The officers of the local corporation are: J. W. Mosier, president; Ira E. Smith, secretary and manager; J. Jerome Smith, treasurer.

Los Angeles, Cal.—A gusher producing a twenty-four gravity petroleum was brought in some ten days ago sixty or sixty-five miles south of Ebano, Mexico, on land belonging to one of the subsidiary companies of the Huasteca Oil Company of this city, controlled by the Mexican Petroleum, Ltd. The output is variously estimated at from 800 to 2,000 barrels a day. It is the lightest yet found in that region, but is similar to what Pearsons have on the Tehuantepec Isthmus. The strike was at 2,000 feet. The scene of the strike is within seven miles of water transportation on the Laguna de Tamiahua, an inlet of the Mexican Gulf, on which, and on the river to Ebano, the company operates two steamers. It has also a yacht for river service, which has been in use eight years, but which could not enter the Laguna on account of its shallowness. Three other wells are to start as soon as the material can be brought in.

San Francisco, Cal.—The Amalgamated Oil Company, controlled by the Associated Oil Company, has just completed boring a new well which will prove a great asset. This well is now producing from 5,000 to 10,000 barrels of oil a day, but aside from its individual value, the discovery means much to the company as indicative of the richness of an entirely new field. The new well is located only a half mile west of Los Angeles, and opens a territory of some 640 acres, all of which can now be considered available as highly productive oil bearing land. The Amalgamated Oil Company is one of the Southern California companies of the Associated and controls a tract of remarkable value some eight miles long, and varying from one to three miles in width. In this field there are about twelve square miles, all situated between Los Angeles and the ocean. On June 1st the Associated Oil Company will move its offices from the eleventh floor of the Kohl Building, at Montgomery and California Streets, to the seventh floor of the new Wells Fargo Building, at Second and Mission Streets, where even more elegant offices than those it now occupies are being prepared.

TELEPHONE AND TELEGRAPH.

San Francisco.—The Board of Supervisors has passed the ordinance reducing the charge for telephones, recently introduced by Mr. Murphy.

San Francisco.—Bids on the propositions for constructing buildings and doing other preliminary work in connection with the installation of wireless telegraph stations at Fort Egbert, Nome, and Fort Gibbon have been opened. A steel tower 200 feet high is to be furnished by the Government, but the material for stations, which will be built according to specifications prepared in Washington, modified and adapted to the conditions existing in Alaska, will be furnished by contractors.

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